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Inspection Methods for Physical Protection Project: Quarterly Report, June-August, 1980

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Prepared for
U.S. Nuclear Regulatory Commission

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Inspection Methods for Physical Protection Project: Quarterly Report, June-August, 1980

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FOREWORD

At the request of the Office of Nuclear Regulatory Research (RES) of the U S. Nuclear Regulatory Commission (NRC), the Lawrence Livermore National Laboratory (LLNL) has initiated the Inspection Methods for Physical Protection (IMPP) project for the NRC Office of Inspection and Enforcement (IE). The IMPP project team is studying the physical protection systems used by NRC licensees and the methods presently used by IE physical protection inspectors to inspect such systems.

The intended result of this effort is production of improved NRC inspection methods and improved inspector training. The benefit to the licensees will be more uniform inspections, more knowledgeable inspectors, and--we anticipate--more cost-effective physical protection systems.

This is a report of work completed in the sixth quarter of the IMPP project, June-August, 1980. The work was supported by the United States Nuclear Regulatory Commission under a Memorandum of Understanding with the United States Department of Energy. The NRC work order is FIN A-0143.

LLNL was established by the U.S. Atomic Energy Commission (AEC) and is operated by the University of California as one of the two national laboratories charged with the design and testing of nuclear weapons. With the advent of the energy shortage, DOE has broadened our mission at LLNL to cover research and development in all aspects of energy, including solar, wind, geothermal, and fossil fuel, as well as commercial nuclear energy. As part of this broadened energy mission, we provide research, development, and technical guidance to the NRC in areas such as waste management, operating safety. seismic safety, and safeguards.

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ABSTRACT

This is the sixth quarterly report to the U.S. Nuclear Regulatory Commission (NRC) on the progress at Lawrence Livermore National Laboratory (LLNL) in the Inspection Methods for Physical Protection (IMPP) project. Besides reporting on one data gathering trip, the evaluation methodology for use by physical protection inspectors in the field, and the progress of the E-Field intrusion detector training film, the report details the production status of the procedures in the replacement modules for physical protection of power reactors, nonpower/research reactors, SSNM fixed sites, and transportation of special nuclear materials.

EXECUTIVE SUMMARY

The Inspection Methods for Physical Protection (IMPP) project of the Lawrence Livermore National Laboratory (LLNL) continued during the sixth quarter, June - August, 1980, to develop written inspection procedures that apply the Code of Federal Regulations to inspection of licensed civilian nuclear facilities. The existing inspection procedures have been expanded to reflect new technology, upgrading of federal regulations, and input from the Office of Inspection and Enforcement and the Regions.

The three original IMPP goals continue: (1) to identify the information needed by the inspectors, (2) to produce that information in a manual usable in the field, and (3) to train the inspectors in the use of that information.

During the fifth quarter, 21 procedures of the draft module for physical protection inspection of nuclear power reactors were critiqued by IE Headquarters and Region inspectors, and were field tested during inspections in Region II. During the sixth quarter, we have revised the procedures to reflect the response given us by IE Headquarters and the Regions following their field tests.

We have delivered drafts of four procedures in transportation of irradiated fuel, and have begun to research and write the procedures on transportation of special nuclear material of moderate and low strategic significance. We have also delivered 12 of the 23 procedures in the inspection module on possession of formula quantities of special nuclear material at fixed sites.

Continuing data acquisition for updating the final version of the physical protection module deliverables and for writing technical considerations to accompany inspection methods has yielded additional significant information which has been reported to NRC Headquarters in the draft report An Overview of Nuclear Research Reactor Regulation (1).

Also during the sixth quarter, team members distributed a trial version of the inspector training videotape on E-Field intrusion detectors and continued to determine which training topics and methods best complement the revised power reactor module.

Work continued on the regulation catalogs, the implementing procedure worksheet, and the procedure adequacy worksheet for inspection of implementing procedures. These are being developed for use by IE inspectors in the field. A description of the methodology was sent to NRC Research for review and comment.

INTRODUCTION

At the close of the first contract year, the Inspection Methods for Physical Protection (IMPP) project at Lawrence Livermore National Laboratory (LLNL) delivered to the U.S. Nuclear Regulatory Commission (NRC) Office of Inspection and Enforcement (IE) and to the Region offices a draft version of the inspection module for physical protection of licensed civilian nuclear power reactors.

At the beginning of the second contract year, three IMPP team members participated in field tests of the power reactor inspection module, and all team members continued acquiring data and writing the modules which during the sixth quarter produced inspection procedures for SSNM fixed sites, for nonpower/research reactors, and for transportation of irradiated fuel. In addition, the requirements of Appendix B and Appendix C to 10 CFR 73 necessitated researching and writing new modules for inspecting the implementation of security personnel training and qualifications plans and contingency plans.

Other IMPP tasks in progress during the sixth quarter include distributing to the Regions a training videotape on E-Field intrusion detectors with accompanying hardcopy scripts and evaluation questionnaires, and developing the procedure evaluation methodology to be used by IE inspectors in the field.

SIXTH QUARTER EFFORT

OVERVIEW OF INSPECTION METHODS FOR PHYSICAL PROTECTION ACTIVITIES

Sixth quarter effort included revising procedures to reflect field testing and critiquing of the power reactor inspection module by IE Headquarters (HQ) and the Regions. We continued to write the inspection procedures on SSNM at fixed sites and to research and write first draft inspection procedures for transportation of SNM of low and moderate significance and for nonpower/research reactors. We further researched and organized the requirements that will evolve during the seventh quarter into modules on Personnel Training and Qualifications Plan based on Appendix B to 10 CFR 73, and the Safeguards Contingency Plan based on Appendix C to 10 CFR 73.

TABLES SHOWING STATUS OF INSPECTION MODULE DELIVERABLES

Tables 1 - 4 show the sixth quarter status of the physical protection inspection modules, which are the IMPP deliverables under amended Schedule 189, revised January, 1980. The letters T, X, N, or F in the module numbers are project indicators of T-transportation; X-power reactor; N-nonpower/research reactor; and F-fixed site. These letters will change to a manual chapter number to be assigned by IE HQ when they approve the final draft modules. Not shown on tables but discussed later are the two new modules being developed for security personnel training and qualifications plans and for safeguards contingency plans.

DISCUSSION OF INSPECTION MODULE DELIVERABLES

Power Reactor Inspection Module 81100

Twenty-one of the twenty-three procedures in the power reactor inspection module had been field-tested in Region II and reviewed by IE HQ and the Regions. During the sixth quarter we revised the draft modules to reflect their comments. Many suggestions were incorporated wholly; some were adapted to the procedure format; some are being held pending discussions at the October 15-16, 1980, IE-RES-IMPP-Regions management meeting.

Table 1. Status report on power reactor inspection module.

Procedure		Status										
81100 Series Replacement		Research	First Draft	LLNL Technical Review	Field Test Draft Delivered	IE Review & Field Test	Revised Draft	LLNL Technical Review	Final Draft	Final Draft Delivered	IE Printing
81X10	Preinspection										
81X14	Orientation										
81X18	Security Plan and Implementing Procedures										
81X22	Security Organization – Management										
81X26	Security Organization – Personnel										
81X30	Security Organization – Response										
81X34	Security Program Audit										
81X38	Records and Reports										
81X42	Testing and Maintenance										
81X46	Locks, Keys, and Combinations										
81X52	Physical Barriers – Protected Area										
81X54	Physical Barriers – Vital Area										
81X58	Security System Power Supply										
81X62	Lighting										
81X66	Assessment Aids										
81X70	Access Control – Personnel										
81X72	Access Control – Packages										
81X74	Access Control – Vehicles										
81X78	Detection Aids – Protected Area										
81X80	Detection Aids – Vital Area										
81X84	Alarm Stations										
81X88	Communications										
81X90	Postinspection										

Table 2. Status report on SSNM fixed sites inspection module.

Procedure		Status									
81200 Series Replacement		Research	First Draft	LLNL Technical Review	Field Test Draft Delivered	IE Review & Field Test	Revised Draft	LLNL Technical Review	Final Draft	Final Draft Delivered	IE Printing
81F10	Preinspection										
81F14	Site Orientation										
81F18	Security Plan and Implementing Procedures										
81F22	Security Organization – Management										
81F26	Security Organization – Personnel										
81F30	Security Organization – Response										
81F34	Security Program Audit										
81F38	Records and Reports										
81F42	Testing and Maintenance										
81F46	Locks, Keys, and Combinations										
81F52	Physical Barriers – PA										
81F54	Physical Barriers – VA, MAA, & CAA										
81F58	Security System Power Supply										
81F62	Lighting										
81F66	Assessment/Surveillance Aids										
81F70	Entry/Exit Control – Personnel										
81F72	Entry/Exit Control – Packages, Material, and SNM										
81F74	Entry/Exit Control – Vehicles										
81F78	Detection Aids – PA										
81F80	Detection Aids – VA, MAA, & CAA										
81F84	Alarm Stations										
81F88	Communications										
81F90	Postinspection										

Table 3. Status report on transportation of SNM inspection module.

Procedure		Status										
81300 Series Replacement		Research	First Draft	LLNL Technical Review	Field Test Draft Delivered	IE Review & Field Test	Revised Draft	LLNL Technical Review	Final Draft	Final Draft Delivered	IE Printing
Irradiated Fuel											
81T05	Preinspection										
81T10	General Requirements										
81T15	Communications										
81T20	Postinspection										
SNM Low and Moderate											
81T30	Preinspection/Moderate – Low										
81T35	General Requirements – Moderate SNM										
81T40	General Requirements – Low SNM										
81T45	Postinspection/Moderate – Low										
SSNM											
81T50	Preinspection										
81T54	General Performance Objectives										
81T57	In-transit Performance										
81T60	General Physical Protection System Requirements										
81T63	Security Organization and Audit										
81T66	Response and Contingency Plan/Procedures										
81T68	Access Control										
81T72	Testing and Maintenance										
81T75	Road Shipment Requirements										
81T76	Air Shipment Requirements										
81T77	Rail Shipment Requirements										
81T78	Sea Shipment Requirements										
81T88	Delivery and Receiving Arrangements										
81T90	Postinspection										

Table 4. Status report on nonpower/research reactor inspection module.

Procedure		Status										
81400 Series Replacement		Research	First Draft	LLNL Technical Review	Field Test Draft Delivered	IE Review & Field Test	Revised Draft	LLNL Technical Review	Final Draft	Final Draft Delivered	IE Printing
81N10	Preinspection										
81N14	Site Orientation										
81N18	Security Plan and Implementing Procedures										
81N22	Security Organization										
81N30	Security Organization – Response										
81N34	Safeguards Contingency Plan Audit										
81N38	Records and Reports										
81N42	Testing and Maintenance										
81N46	Locks, Keys, and Combinations										
81N54	Physical Barriers – PA, MAA, & CAA										
81N62	Lighting										
81N66	Assessment/Surveillance Aids										
81N70	Entry/Exit Control – Personnel										
81N72	Entry/Exit Control – Packages/SNM										
81N74	Entry/Exit Control – Vehicles										
81N80	Detection Aids										
81N84	Alarm Stations										
81N88	Communications										
81N90	Postinspection										

IMPP Response to Comments from IE Headquarters and Region Inspectors on the Power Reactor Module Draft. We have incorporated the generic changes that most closely satisfy the diverse critique of the power reactor module draft into the revision of that module as well as into the SSNM Fixed Sites module draft, and will incorporate these changes into the other procedures now being written.

For example, Region concern surrounded Section 5.0 in each procedure, SCHEDULING, MANPOWER, AND EQUIPMENT REQUIREMENTS. Our purpose was to make every procedure stand alone; therefore, the requirements pertain to each individual procedure if exercised separately. Usually the inspector will be using most, if not all, of the procedure subsections at the same time, as well as using several procedures at the same time, which would considerably reduce the time necessary to complete an inspection. Recommended grouping for concurrent use of inspection procedures is given in the PREINSPECTION procedure, Section 7.0 TECHNICAL CONSIDERATIONS AND SUPPLEMENTARY INFORMATION.

Here is another example of IMPP response to IE HQ or Region comment: Audit teams, whether licensee personnel or consultants, should not be required to first be knowledgeable about the site security program or its physical security plan. If they were, the independence of the audit could be compromised.

And one more example: We are revising our procedure on records and reports in the power reactor module and will reflect this revision in other forthcoming modules by dealing only with what records and reports are required and their required retention periods. The content of records and reports for specific system elements will be evaluated in the inspection procedure for those specific elements. Likewise, the testing and maintenance (T&M) procedures will deal with the establishment and evaluation of overall T&M programs. The methods for evaluating the T&M of system elements will be included in the inspection procedures for each system element.

Restructured Security Organization Procedures for the Power Reactor and SSNM Fixed Sites Modules. Further exchange of ideas with IE HQ and the Regions led to our restructuring the procedures that give guidance on security organization. The first draft of 81X30 Security Organization was based on guidance available at the time it was written. Subsequently, NMSS developed acceptance criteria for training and qualifications (T&Q) and for contingency plans reported in the NUREG-0674 draft and in Review Guideline #24. The IMPP team and IE HQ have decided to continue the regular security organization activities in the familiar procedures and to write separate modules for evaluating implementation of security organization training and qualifications plans and safeguards contingency plans.

The security organization procedure will be divided into three procedures that will assume the following titles for both the power reactor module and the SSNM fixed sites module:

- 81X22 and 81F22 Security Organization--Management
- 81X26 and 81F26 Security Organization--Personnel, (excludes all detailed treatment of Appendix B information)
- 81X30 and 81F30 Security Organization--Response, (excludes all detailed treatment of Appendix C information)

A new module of inspection procedures is being written called Personnel Training and Qualifications Plan (Appendix B to 10 CFR 73) with the following procedure titles:

- 815X1 General Requirements for Personnel
- 815X2 Additional Requirements for Power Reactor and Fixed Site Personnel
- 815X3 Additional Requirements for Transportation Personnel

Another new module is being written called Safeguards Contingency Plan (Appendix C to 10 CFR 73). This module contains only one procedure:

- 816X1 Safeguards Contingency Plan Review

These new draft modules, which contain detailed guidance according to requirements in Appendix B and Appendix C, will be delivered to IE HQ and the Regions upon completion.

SSNM Fixed Sites Inspection Module 81200 Replacement

We have delivered 12 of the 23 procedures in the SSNM Fixed Sites draft module to IE HQ and the Regions during the sixth quarter. These delivered procedures were printed on both sides of the pages so they more closely anticipate the appearance of the finished deliverables. The other procedures are being revised from the procedures they replace, are being researched and written from 10 CFR Parts 50 and 73 and other sources, or are being adapted from the power reactor module.

Transportation of SNM 81300 Replacement

We have delivered to IE HQ and the Regions the module comprising the draft inspection procedures for inspection of transportation of irradiated fuel. The procedures for inspection of transportation of low and moderate SNM and for transportation of SSNM are being researched and written and will be delivered in the seventh quarter. No IMPP team participation is scheduled by IE for simulated field testing of these procedures; however, forthcoming critique from the IE HQ and the Regions on the irradiated fuel procedures draft will be reflected in revisions and in new procedures as they are being written. At present the Regions are not inspecting transportation of irradiated fuel and low and moderate SNM, but the inspection procedures will be in place when they are required.

Nonpower/Research Reactor Module 81400 Replacement

We have applied the regulations to the development and writing of nonpower/research inspection procedures and will submit the draft module to IE HQ and the Regions during the seventh quarter.

DATA ACQUISITION FOR NEW MODULES

We have continued to gather data for the deliverables by assembling regulations, regulatory positions, industry and military specifications, input from IE HQ and the Regions, and nuclear industry survey. This information is chiefly used in writing inspection procedures or is reported separately.

Draft Report: An Overview of Nuclear Research Reactor Regulation

Information gathered by the IMPP team, assisted by a subcontractor, was of such significance to merit a separate report to HQ, An Overview of Nuclear Research Reactor Regulation (1). This report presented findings of investigation into four aspects affecting regulation of nonpower and research nuclear reactors: 1) current regulatory practices and inspection procedures; 2) present physical protection systems used by NRC reactor licensees; 3) regulatory practices and inspection procedures of other U.S. agencies and international agencies; and 3) consequences of radiological sabotage at nonpower and research reactors.

This report concludes that the Upgrade Rule requirements will affect the nonpower and research reactor community in various ways:

- Most nonpower and research reactor licensees in private industry and government will easily and willingly meet the upgraded requirements. In many cases, the necessary additions to existing physical protection systems will be minimal, due to the high quality of the present systems.

- Some University reactor licensees fall into the above category and will upgrade easily, although somewhat less willingly.

- A large number of university reactor licensees will resist the upgrade, some to the extent of threatening to decommission their reactors rather than comply with the Upgrade Rule requirements.

PROCEDURE EVALUATION METHODOLOGY

Following NRC acceptance last quarter of the study on Feasibility of Field Evaluation of Physical Protection Procedures (2), we have written a description and illustration which describe what the methodology will contain and the step-by-step way an inspector will use it. Work has continued on developing the methodology. We have produced the first draft versions of the regulation catalogs for power reactors, fixed sites, and transportation activities. Worksheets that can be used by inspectors for evaluating compliance and adequacy are being developed.

The inspector will use the implementing procedure worksheet and a regulation catalog to determine procedure compliance. The inspector will likewise use the procedure adequacy worksheet as an aid in determining procedure adequacy. The adequacy worksheet will be based upon a set of procedure attribute questions that use simple yes-no scoring.

TRAINING TO ACCOMPANY THE POWER REACTOR MODULE

During the sixth quarter IMPP prepared to distribute the videotape on E-Field intrusion detectors to the Regions, along with hardcopy scripts and evaluation questionnaires. IE HQ and Region response after previewing the videotape will be used to assist in designing future training videotapes, slides, and scripts.

Our summary table of training aid requirements identified 47 areas of knowledge or skills called for in the power reactor module. These areas are being studied to determine which medium could best carry the training message: film, videotape, hardcopy, slides, or workshops. We are further testing the rationale for including each item in the training program or for including it in the inspection procedure. This information in draft tabular form is being used in the ongoing training development program.

TRIPS

Members of the IMPP team traveled to the Diablo Canyon Nuclear Power Plant 12 miles southwest of San Luis Obispo, California, on July 24, 1980, with 20 other LLNL employees. Although this trip was not an IMPP assignment, the team members benefited from the tour by explanations given concerning the seismic retro-fit and by being able to view areas not ordinarily accessible when the reactor is on-line, notably the control room and the containment area.

NRC RES--LLNL SAFEGUARDS MANAGEMENT MEETING

E. Richard and R. Shepherd of NRC Headquarters Research Branch met with Safeguards management at LLNL on July 22, 1980, to share ideas and to give direction to the safeguards programs. Also participating in the meeting were C. Minichino, Ph.D., a new member of the IMPP project, and representatives from Stanford Research International (SRI) and Battelle's Pacific Northwest Laboratories (PNL). All of those attending were working on various material control and accounting (MC&A) or physical protection (PP) activities for the NRC, and they met to share information and adjust efforts. E. Richard explored channels in which the MC&A and PP portions of IE could combine results of their research and project activities.

CONTINUING EFFORT

Effort in the seventh quarter will focus upon completing and delivering to NRC the 11 remaining draft inspection procedures for fuel cycle facilities, and the draft procedures for transportation of low and moderate SNM and transportation of SSNM. The draft module for inspection of nonpower/research reactors will be revised to conform to forthcoming response and revisions to the power reactor module. The draft power reactor module, having been revised to reflect results of field testing and critique from IE HQ and the Regions, will await acceptance from IE following an October management meeting before IMPP's final preparation of camera-ready masters.

We will continue to work on inspector training to complement the power reactor module and to develop the physical protection modules for evaluating implementation of guard training and qualifications plans per Appendix B to 10 CFR 73 and for evaluating safeguards contingency plans per Appendix C to 10 CFR 73.

We will also continue to develop the procedure evaluation methodology for use by IE inspectors in the field.

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2. J. Savage, Feasibility of Field Evaluation of Physical Protection Procedures, Lawrence Livermore National Laboratory, Livermore, California, NUREG/CR-1315, UCRL-52740 (1980).**

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